May 25, 1965 J. P. ELLENBERGER 3,185,793

PUSHBUTTON OPERATED OVERLOAD CIRCUIT BREAKER

Filed July 13, 1962 2 Sheets-Sheet 1

FIG.1

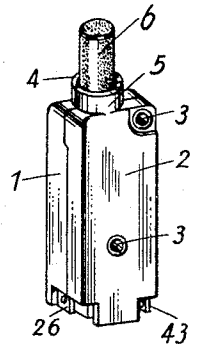


FIG.2

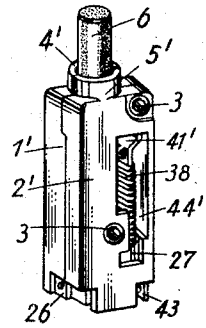
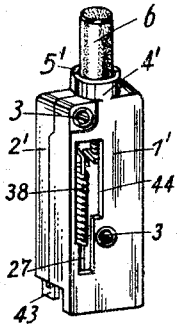


FIG.3



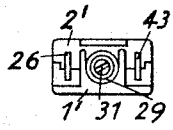


FIG.4

FIG.5

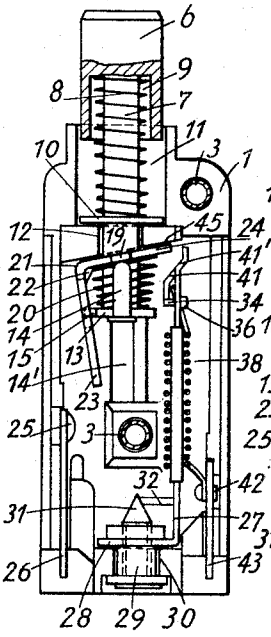


FIG.6

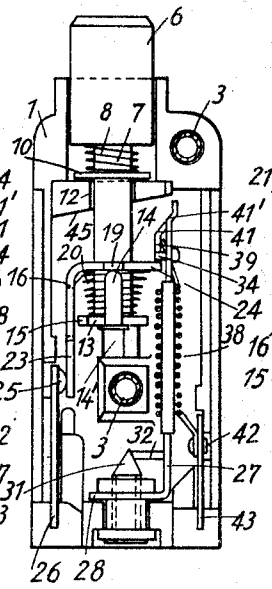
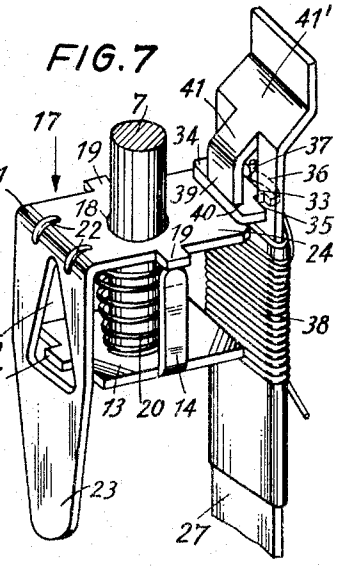


FIG.7



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PUSHBUTTON OPERATED OVERLOAD CIRCUIT BREAKER

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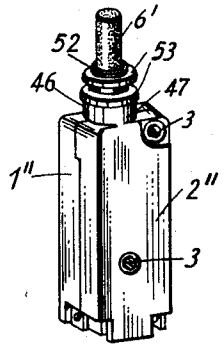


FIG. 8

FIG. 9

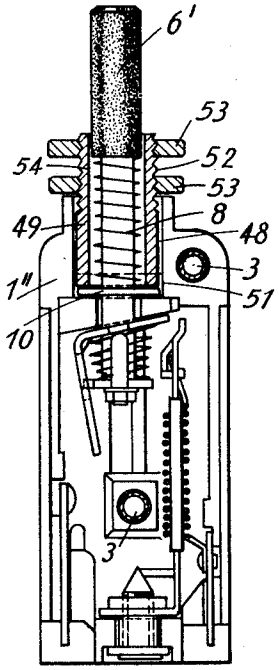


FIG. 10

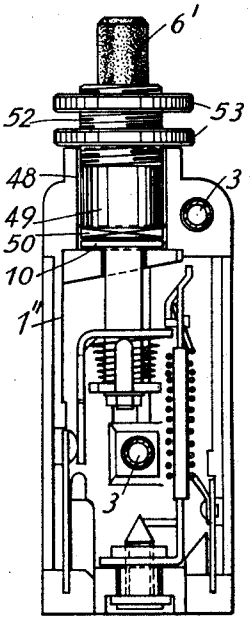


FIG. 11

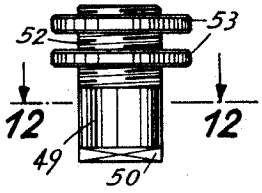
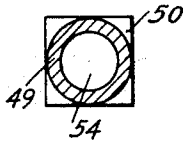


FIG. 12



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PUSHBUTTON OPERATED OVERLOAD CIRCUIT BREAKER

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11 Claims. (Cl. 200—116)

The present invention relates to a pushbutton-operated overload circuit breaker which is provided with a thermal release and a trip-free release.

There is a known overload circuit breaker of this type which is provided with a contact bridge in the form of an angular lever which is freely pivotable on projections of a control bridge which is rigidly connected by a control rod to the spring-loaded pushbutton and is mounted so as to be slidable in the axial direction of the control rod against the action of a spring which rests on the control bridge. When this known circuit breaker is switched off, its contact bridge is pressed by the projections of the control bridge against an inclined surface in the housing, while when it is switched on, the contact bridge is taken along by the control bridge and moved behind a holding projection on the bimetallic strip so as to be arrested thereby. This known overload circuit breaker has to be made of relatively large dimensions, especially also because its control bridge which consists of molded material is of a considerable size.

It is an object of the present invention to provide an overload circuit breaker of a similar kind as mentioned above but of very small dimensions which may be produced inexpensively, in a simple manner, and with a small amount of material, and which operates very reliably for a long time.

This object is attained according to the invention by making the control bridge of a piece of sheet metal which is secured and preferably riveted to the free end of the control rod and is provided at the side facing the arm of the contact bridge which extends substantially parallel to the control rod with an integral tongue-like coupling projection when the pushbutton is being depressed, engages into an aperture in the mentioned arm of the contact bridge. The control bridge is therefore made of a piece of sheet metal at practically no waste of material which facilitates its production considerably. According to another feature of the invention, the contact bridge may likewise consist of sheet metal, namely, of copper, with flat arms. For reinforcing and stiffening the contact bridge which is made of relative thin sheet copper in the form of an angular lever, its bend is provided with one or more reinforcing beads. The aperture in the arm of the contact bridge which extends substantially parallel to the control rod may form an isosceles triangle, the base of which extends transverse to this arm and at the side of the triangle facing the free end of the arm. An aperture of this shape has the advantage that it will not weaken the arm too much. The base of the triangle forms an edge on which the tonguelike projection of the control bridge engages when the pushbutton is depressed to its on position so that the contact bridge is likewise moved to its on position.

According to a further feature of the invention, the arm of the contact bridge which extends substantially parallel to the control rod is made of a greater length than the other arm. This longer arm forms a contact member which cooperates with another fixed contact. When these two contacts are separated, the foot of the arc which is then formed moves toward the free end of the longer arm of the contact bridge where the arc is drawn

apart and extinguished. This longer arm works like a horn-shaped lightning arrester. It decreases in width toward its free end.

The contact bridge may be made in a very simple manner by stamping, and it is stamped in the direction in which, when the circuit breaker is assembled, the pushbutton is located so that the outer edge of the shorter horizontal arm facing the pushbuton will be sharp. This has the advantage that when the bimetallic strip is in the holding position, the holding projection thereon will properly engage with and hold the contact bridge so that the bimetallic strip will not release the contact bridge as the result of shocks and vibrations to which the circuit breaker might be subjected.

When—as already indicated—the pushbutton is being depressed to move it to its on position, the contact bridge will be taken along by the coupling projection on the control bridge until the end of the shorter arm of the contact bridge snaps behind the holding projection on the bimetallic strip. If the bimetallic strip bends due to being heated by an overcurrent, its holding projection will release the contact bridge so that under the action of the release spring the contact bridge together with the control rod and the pushbutton will be moved to the off position. If the pushbutton is held in the on position either by hand or by being accidentally wedged so that at the occurrence of an overcurrent the release spring cannot become active, the other spring which is mounted on the control rod and acts at one side upon the control bridge and at the other side upon the contact bridge will move the contact bridge to its off position after being released by the bent bimetallic strip. In order to insure that this spring which effects the trip-free release will not be clamped or bound on the control rod but will be fully effective, the invention further provides that this coil spring is made of a frustoconical shape and that its wider end engages with the contact bridge.

The manufacture of the overload circuit breaker according to the invention may be further simplified by providing the bimetallic strip near its free end with an aperture into which the necked-down portion of a small copper plate is inserted which serves as the holding projection of the bimetallic strip. The shoulders which are formed on the copper plate by this necked-down portion then engage upon the portions of the bimetallic strip at both sides of the aperture, and the necked-down portion is then riveted at the other side of the bimetallic strip. This copper plate may also be produced by stamping, whereas the holding projections on the bimetallic strips of the known kinds of overload circuit breakers had to be specially molded. The copper plate may extend in the aperture at right angles to the longitudinal direction of the bimetallic strip so that a wide contact surface results which forms the actual holding projection and overlaps the free end of the shorter arm of the contact bridge when the bimetallic srtip is in its straight holding position. The manufacture of the circuit breaker may be further simplified by providing the necked-down part of the copper plate near the end which is to be riveted with a bore into which one end of the wire of the heating coil is inserted so that, when the copper plate is riveted to the bimetallic strip, the wire will also be securely clamped thereto. The riveting of the copper plate therefore also insures a reliable electric connection of this wire and there is thus no need for the usual rather complicated and expensive soldering of this end of the wire of the heating coil.

In order to secure the copper plate firmly within the aperture of the bimetallic srtip, the latter is provided at the side of the copper plate facing the free end of the bimetallic strip with a tongue which is stamped out of the

plane of the strip in the direction toward the contact bridge when the aperture is punched into the strip. After the copper plate is inserted into the aperture in the bimetallic strip and is riveted thereto, the free end of this tongue bears upon the flat surface of the riveted copper plate and prevents it from ever being loosened in the slot-shaped aperture of the bimetallic strip.

According to another feature of the invention, the mentioned tongue on the bimetallic strip is bent so as to have an inclined back forming a cam surface and so that the outer edge of the end of the tongue is in line with the corresponding edge of the copper plate. Therefore, when the pushbutton is being depressed, the end of the shorter arm of the contact bridge will slide easily along this inclined cam surface of the tongue and over the edge of the copper plate until it snaps behind the latter. This cam surface may be extended at the same or a similar inclination by also bending the upper end of the bimetallic strip directly adjacent to the beginning of the tongue.

For guiding the pushbutton very simply and reliably and for also providing very simple means for mounting the circuit breaker, a bushing is inserted into the two-part housing. The cylindrical bore of this bushing serves for guiding the pushbutton, while the part of the bushing which projects from the housing is provided with an external screw thread for mounting the circuit breaker. By means of two nuts which may be screwed upon the screw thread, the entire circuit breaker may be secured, for example, to a flat projection or in an aperture in a wall. For preventing the bushing from turning within the two-part housing, it may be provided with a square-shaped part which engages into corresponding recesses in the two housing parts. This square-shaped part of the bushing is preferably provided on its inner end and made rather thin. It operates like a flange and also prevents the bushing from shifting in the axial direction. For reasons of stability, the bushing is made of metal, preferably of aluminum.

According to a further feature of the invention, one or both parts of the housing of the circuit breaker may be provided with an aperture at an area adjacent to the bimetallic strip so that the heat which the heating coil develops within the housing may be dissipated to the outside and the bimetallic strip may cool more quickly after releasing the contact bridge. These apertures in one or both parts of the housing may also serve for conducting the temperature surrounding the circuit breaker to the bimetallic strip so that the latter will then act as a thermostat. If the circuit breaker is to be used solely for this purpose, the heating coil on the bimetallic strip may be omitted.

As the result of the various features of the overload circuit breaker according to the invention, its housing may be made of such small dimensions that the width of the housing vertically to the bimetallic strip may be made smaller than twice the thickness of the housing.

The above-mentioned as well as additional objects, features, and advantages of the invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which—

FIGURE 1 shows a perspective view of an overload circuit breaker according to the invention;

FIGURE 2 shows a perspective view of the same circuit breaker as in FIGURE 1, but in which the housing is provided with apertures in the parts adjacent to the bimetallic strips;

FIGURE 3 shows a rear view of the circuit breaker according to FIGURE 2;

FIGURE 4 shows a bottom view of the circuit breaker according to FIGURE 1 or FIGURE 2;

FIGURE 5 shows an enlarged front view of the opened circuit breaker according to FIGURE 1 in its off position;

FIGURE 6 shows the circuit breaker according to FIGURE 5 in the on position;

FIGURE 7 shows an enlarged perspective view of the switch mechanism of the circuit breaker according to FIGURES 1 to 6;

FIGURE 8 shows a perspective view of an overload circuit breaker similar to that as shown in FIGURE 1, but with a metal bushing inserted into the housing for guiding the pushbutton and for mounting the entire circuit breaker;

FIGURE 9 shows an enlarged front view similar to FIGURE 5 of the circuit breaker according to FIGURE 8, with the metal bushing being shown in cross section;

FIGURE 10 shows the circuit breaker according to FIGURE 9 in the on position;

FIGURE 11 shows a detail view of the metal bushing; while

FIGURE 12 shows a cross section taken along the line XII—XII of FIGURE 11.

The overload circuit breaker according to the invention, as illustrated in FIGURES 1 to 7, comprises a housing which consists of two shells 1 and 2 or 1′ and 2′, respectively, which are designed so as to permit the individual parts of the circuit breaker to be inserted into the shell 1 or 1′ and to be held in position therein by the shell 2 or 2′. The two shells 1 or 1′ and 2 or 2′ which are made of a molded insulating material are connected to each other by tubular rivets 3. The upper end of each shell 1, 1′ and 2, 2′ is provided with a semi-circular flange 4, 4′ and 5, 5′, respectively, from which the pushbutton 6 projects which also consists of a molded material and is integral with a control rod 7 on which a release spring 8 is mounted. This spring 8 acts at one end upon the base of an annular recess 9 in the pushbutton 6 and at the other end upon a washer 10 of insulating material which rests on the base of a cylindrical recess 11 in the housing 1, 2 or 1′, 2′. The control rod 7 is guided in a cylindrical recess 12 in the two housing parts 1, 2 or 1′, 2′ and its lower end carries a control bridge 13 which is riveted thereto. As shown particularly in FIGURE 7, this control bridge 13 consists of a piece of sheet metal, for example, brass, and has two vertical prongs 14 which are guided in grooves 14′ in the two shells 1, 2 or 1′, 2′, and a coupling projection 15 which is operatively associated with a triangular aperture 16 in the contact bridge 17 or support member. This contact bridge 17 is stamped out of a relatively thin sheet of copper and is silver-plated. It is provided with a bore 18 through which the control rod 7 extends which is guided thereon so as to be able to slide in the axial direction along rod 7 and also to pivot with its two lateral projections 19 about the upper edges of the prongs 14. Between the contact bridge 17 and the control bridge 13, the control rod carries a coil spring 20 of a frusto-conical shape, the end of which with the largest diameter acts upon the contact bridge 17.

Contact bridge 17 comprises a longer arm 23 and, extending substantially at a right angle thereto, a shorter arm 24. The bend between these two arms is reinforced by stiffening beads 22. FIGURE 7 shows that the longer arm 23 decreases in width toward its lower end. This arm 23 forms a contact surface which cooperates with a fixed contact 25 on a terminal strip 26 which, as shown particularly in FIGURES 1 to 3, projects from the housing 1, 2 or 1′, 2′. The shorter arm 24 of contact bridge 17 cooperates with a bimetallic strip 27, the lower end 28 of which is bent at a right angle and secured to a bushing 29 which during the assembly of the circuit breaker is inserted into a semicircular recess 30 in the housing part 1 or 1′ and is clamped therein in the axial direction. Bushing 29 is internally threaded, and a setscrew 31 is screwed therein which has a conical tip engaging upon a vertically bent part 32 of the bimetallic strip 27. By means of the setscrew 31 it is possible to adjust the initial tension of the bimetallic strip 27 and thus the current at which the circuit breaker is released.

Near its upper end, the bimetallic strip 27 is provided with an aperture 33 into which the necked-down part of a small stamped-out copper plate 34 is inserted which rests with its shoulders 35 on the bimetal strip 27, while the projecting end of the necked-down part is riveted at 36 to the other side of the bimetallic strip 27. Before the riveting, the upper end 37 of the wire of the heating coil 38, which is mounted on but electrically insulated from the bimetallic strip 27, is inserted through a small transverse bore in the necked-down part of copper plate 34 so that, when the latter is riveted, the end of the wire is likewise securely clamped in its bore and electrically connected to the copper plate which serves as a holding projection for the contact bridge 17. Above the copper plate 34, the bimetallic strip 27 has a tongue 39 which is stamped out of the strip whereby the aperture 33 is also formed. The lower edge 40 of this tongue rests on the upper side of the copper plate 34 which, in turn, rests on the lower wall of the aperture 33. The inclined surface 41 of tongue 39 serves as a cam for guiding the contact bridge 17 when the pushbutton 6 is being depressed to close the circuit. This inclined surface 41 is extended in length by an inclined surface 41' which is formed by bending the upper end of the bimetallic strip backwards at the point where the tongue 39 projects from the vertical plane of the strip. The other end of the wire of the heating coil 38 is riveted at 42 to a terminal strip 43.

As illustrated in FIGURES 2 and 3, housing 1', 2' may be provided with apertures 44 and 44' through which the heat which is developed in the housing may be dissipated to the outside, while the outside temperature may also pass through these apertures to the bimetallic strip 27 and heat the same, so that the circuit breaker will also respond to the temperature surrounding it.

If the circuit breaker as illustrated in FIGURES 2 and 3 is to be used solely as a thermostat, the heating coil 38 on the bimetallic strip may be omitted. The bimetallic strip 27 is then electrically connected directly to the terminal strip 43.

The operation of the circuit breaker according to FIGURES 1 to 7 occurs as follows:

Assuming that an excess current occurs when the circuit breaker is in the on position, as illustrated in FIGURE 6, in which the internal circuit of the circuit breaker extends from the terminal strip 26 via the contact 25, the contact bridge 17, the copper plate 34, and the heating coil 38 to the other terminal strip 43, the heating coil 38 will then heat the bimetallic strip 27 so that the latter will bend and the copper plate 34 thereon will thereby release the right end of arm 24 of contact bridge 17. Under the action of the release spring 8, the prongs 14 on the control bridge 13 shift the contact bridge 17 to the off position as illustrated in FIGURE 5, in which its arm 24 engages upon an inclined surface 45 of the housing 1, 2 or 1', 2'.

It may happen that the pushbutton 6 is either held down by hand or is accidentally wedged in the position as shown in FIGURE 6. If an overcurrent there occurs and the bimetallic strip 27 by being heated is bent so as to release the contact bridge 17, the release spring 8 cannot act on the control rod 7 to return it to the off position. In this case, the conical spring 20 will press the contact bridge 17 to its off position in which its arm 24 engages upon the inclined surface 45. Spring 20 therefore serves to effect a trip-free release of the circuit breaker.

In order to close the circuit breaker, pushbutton 6 is depressed until the right end of arm 24 of the contact bridge 17 slides along the inclined surface 41', 41 and tongue 39 and over and behind the edge of the copper plate 34. When the pushbutton 6 is released, the contact bridge 17 will be pivoted slightly in the clockwise direction about the copper plate 34 by which it is held until arm 23 of the contact bridge 17 engages upon the contact 25 on the terminal strip 26, as shown in FIGURE 6.

The housing of the circuit breaker as above described may be made, for example, of a thickness of 11 mm., a width of 19 mm., and a length of 42 mm. (without the semicircular flanges 4, 4' and 4, 5').

The housing of the circuit breaker may also consist of a shell part into which all of the components are inserted, and of a cover which may consist, for example, of laminated paper or plastic and covers up these components and secures them in their respective position within the shell part. Both the shell part and the cover plate should then be provided with a groove 14' in which the prongs 14 on the control bridge 13 are guided during the movement thereof.

The housing of the circuit breaker according to the modification of the invention as illustrated in FIGURES 8 to 12 likewise consists of two halves 1'' and 2'' which are connected to each other by tubular rivets 3. They also have at their upper ends semicircular flanges 46 and 47 and semicylindrical recesses 48 into which a cylindrical metallic bushing 49, for example, of aluminum is inserted which is provided at its lower end with a square flange portion 50, as shown particularly in FIGURES 11 and 12, which engages into corresponding recesses 51 at the lower end of the semicylindrical recesses 48 so as to lock the bushing 49 against rotation and against a movement in the axial direction. The end of bushing 49 which projects from the housing 1'', 2'' is provided with a screw thread 52 upon which two nuts 53 are screwed. The bore 54 of bushing 49 serves for guiding the pushbutton 6' and also contains the release spring 8 which acts at one end upon the pushbutton 6' and at the other end upon the washer 10.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. In a pushbutton-operated overload circuit breaker having a thermal release and a trip-free release, a housing having an inclined stop surface therein, a pushbutton slidable in the upper end of said housing and projecting therefrom, a control rod extending downwardly within said housing and secured at its upper end to said pushbutton, a control bridge made of sheet metal secured to the lower end of said control rod and having a pair of upright projections forming pivots, a fixed contact in said housing, a contact bridge forming an angular lever having two arms, the first of said arms extending downwardly and having a coupling aperture and adapted to engage with said fixed contact, the second arm extending at a substantially right angle to said first arm and having an aperture, said control rod extending through said last aperture and having a diameter smaller than said last aperture so as to permit said contact bridge to slide along said control rod and also to pivot relative thereto, a return spring tending to move said pushbutton, said control rod, said control bridge and said contact bridge in the upward direction to the off position in which said second arm of said contact bridge engages upon said inclined stop surface and said contact bridge is thereby pivoted to an inclined position relative to said control rod, a coupling member integral with said control bridge and projecting therefrom toward said first arm and adapted to engage into said coupling aperture in said first arm when said contact bridge is pivoted to said inclined position and to engage upon the lower edge of said aperture when said pushbutton together with said control rod and control bridge is being depressed so as to take along said contact bridge in the downward direction, a bimetallic strip within said housing and secured thereto at its lower end, said bimetallic strip provided with an aperture

near its free end, said bimetalic strip also having a holding projection near its upper end, said holding projection comprising a small flat copper plate adapted to overlap and engage with the free end of said second arm of said contact bridge when said pushbutton is depressed and said bimetallic strip is not heated, said plate having a pair of shoulders engaing upon the side of said bimetallic strip facing said second arm, and further having a necked-down part extending through said aperture in said bimetallic strip, the free end of said necked-down part being riveted to the other side of said strip, said holding projection also adapted to engage with the free end of said second arm of said contact bridge, when near the end of the downward movement of said contact bridge said second arm slides over and is arrested by said holding projection whereby, when said pushbutton is then released and moved slightly outwardly by the action of said return spring, said contact bridge is pivoted by said holding projection about said upright projections to a position in which said first arm engages with said fixed contact, and a second spring interposed between said two bridges and acting upon said contact bridge to move the same along said control rod and into engagement with said inclined stop surface if said bimetallic strip is heated and bent so as to release said second arm and disconnect said first arm from said fixed contact in the event that said pushbutton, control rod, and control bridge are not returned to their off position by said return spring.

2. An overload circuit breaker as defined in claim 1, said necked-down part having a bore extending transversely therethrough, a heating coil mounted on and insulated from said bimetallic strip, one end of said heating coil being inserted through said bore, the free end of said necked-down part being riveted to the other side of said strip and said riveting also securing and electrically connecteing said end of said coil to said copper plate.

3. An overload switch as defined in claim 1, in which said bimetallic strip is provided near its free end with a tongue stamped out of said strip so as to project toward said second arm and thereby forming an aperture in said strip, said holding projection comprising a small flat copper plate extending transversely of said bimetallic strip and adapted to overlap and engage with the free end of said second arm of said contact bridge when said pushbutton is depressed and said bimetallic strip is not heated, said plate having a pair of shoulders engaging upon the side of said bimetallic strip facing said second arm and further having a necked-down part extending through said aperture in said strip and engaging with the lower edge of said aperture, the free end of said necked-down part being riveted to the other side of said strip, the free end of said tongue engaging with the upper side of said copper plate so as to brace said plate.

4. An overload switch as defined in claim 1, in which said bimetallic strip is provided near its free end with a tongue stamped out of said strip so as to project toward said second arm and thereby forming an aperture in said strip, said holding projection comprising a small flat copper plate extending transversely of said bimetallic strip and adapted to overlap and engage with the free end of said second arm of said contact bridge when said pushbutton is depressed and said bimetallic strip is not heated, said plate having a pair of shoulders engaging upon the side of said bimetallic strip facing said second arm and further having a necked-down part extending through said aperture in said strip and engaging with the lower edge of said aperture, the free end of said necked-down part being riveted to the other side of said strip, the free end of said tongue engaging with the upper side of said copper plate and the outer edge of said free end being flush with the outer edge of said plate so as to brace said plate, the outer side of said tongue facing said second arm forming a cam surface so that, when said pushbutton is being depressed, the free end of said second arm will slide downwardly along said cam surface and then over the edge of said copper plate.

5. An overload switch as defined in claim 1, in which said bimetallic strip is provided near its free end with a tongue stamped out of said strip so as to project toward said second arm and thereby forming an aperture in said strip, said holding projection comprising a small flat copper plate extending transversely of said bimetallic strip and adapted to overlap and engage with the free end of said second arm of said contact bridge when said pushbutton is depressed and said bimetallic strip is not heated, said plate having a pair of shoulders engaging upon the side of said bimetallic strip facing said second arm and further having a necked-down part extending through said aperture in said strip and engaging with the lower edge of said aperture, the free end of said necked-down part being riveted to the other side of said strip, the free end of said tongue engaging with the upper side of said copper plate and the outer edge of said free end being flush with the outer edge of said plate so as to brace said plate, the outer side of said tongue facing said second arm being downwardly inclined relative to said strip and forming a cam surface, and the end of said strip directly above the beginning of said tongue being bent at an angle similar to that of said inclined tongue so as to form an extension of said cam surface so that, when said pushbutton is being depressed, the free end of said second arm will slide downwardly along said cam surface and then over the edge of said copper plate.

6. An overload circuit breaker as defined in claim 1, in which said housing comprises two shells having a plurality of recesses in at least one of said shells, all of said means within said housing being inserted into said recesses and being held in a fixed position by the other shell, and a metallic bushing inserted into the upper end of said shells for guiding said pushbutton and having a part with an external screw thread projecting from said housing for mounting said circuit breaker and a thin outwardly projecting square-shaped part at the inner end of said bushing engaging into corresponding recesses in said two shells for preventing said bushing from turning and from shifting in its axial direction, and means for securing said shells to each other.

7. An overload circuit breaker as defined in claim 1, in which said housing has at least one aperture in its wall at a part thereof adjacent to said bimetallic strip.

8. An overload circuit breaker as defined in claim 1, in which the width of said housing vertically to said bimetallic strip is smaller than twice the thickness of said housing.

9. An overload circuit breaker comprising a support member having a top portion provided with an opening therewithin, an arm connected to one side of said top portion provided with an aperture therewithin; a bimetal strip member in operative relationship with the opposite side of said top portion and spaced from said arm, a control rod member substantially parallel to said arm and disposed within said opening, a sheet metal member connected to the lower end of said control rod, said sheet metal member having a coupling projection disposed and supported within said aperture, and a coil spring member having a truncated-cone configuration disposed upon said control rod between the top portion of said support and said sheet metal member, the end of said coil spring having the smallest diameter being adjacent said sheet metal member.

10. An overload circuit breaker as defined in claim 9 wherein said support member is made of silver plated thin sheet copper and a reinforcing member disposed between said support member and said arm.

11. An overload circuit breaker comprising a support member having a top portion provided with a substantially circular opening therewithin, an arm connected to and substantially longer than said top portion and pro-

vided with an aperture therewithin in the form of an isosceles triangle having a base, a bi-metal strip member in operative relationship with the opposite side of said top portion and spaced from said arm, a cylindrical rod member substantially parallel to said arm and disposed within said opening, a sheet metal member connected to the lower end of said control rod, said sheet metal member having a coupling projection disposed and supported within said aperture and abuttable with the base thereof, and a coil spring member having a truncated-cone configuration disposed upon said control rod between the top portion of said support and said sheet

metal member, the end of said coil spring having the smallest diameter being adjacent said sheet metal member.

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